Electromagnetic Material Structure Design

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Chapter 1

Introduction

The ElectroScience Laboratory (ESL) has assisted the NASA in a variety of tasks involving the electromagnetic scattering from material structures. The earlier tasks involved the measurement of electrical properties for materials at elevated temperatures. This has led to the development of two- and three-dimensional finite element codes to calculate the scattered fields from material structures.

The following material reviews the major activities and accomplishments for the current grant.

Chapter 2

Aperture Material Measurements

A thorough study [1] was completed for the material parameter determination using reflection coefficients from material covered apertures. Both rectangular and coaxial apertures were examined. Computer codes were written to obtain the material parameters from measurements. The material configuration consisted of homogeneous slabs and homogeneous slabs with a laminated resistive sheet.

Chapter 3

Low Frequency Nulling

A general investigation of the scattering characteristics for edge terminations at low frequencies was completed. Different canonical edge terminations and treatments were examined. The treatments included various configurations of shaping, resistive sheets and bulk loss. All results have been reported in [2] which also was a master's thesis.

Chapter 4

Conclusion

Two topics were studied during this grant period which all relate to electromagnetic scattering from material based structures. As a result of these studies, all future activities will be focused towards 3D numerical modeling of the scattering from material structures. Current efforts are at developing a time domain version of an existing frequency domain version to determine which approach will be the most desirable for 3D calculations.

Bibliography

[1] K. Komisarek, A. Dominek and N. Wang, "Material Measurements Using Groundplane Apertures, "Technical Report 731507-1, October 1995, The Ohio State University ElectroScience Laboratory, Department of Electrical Engineering; Prepared under Grant Number NAG3-1785, NASA Lewis Research Center.

[2] B. Gray, A. Dominek and N. Wang, "A Numerical Analysis of Electromagnetic Scattering From Two-Dimensional Edge Terminations," Technical Report 731507-2, December 1995, The Ohio State University ElectroScience Laboratory, Department of Electrical Engineering; Prepared under Grant Number NAG3-1785, NASA Lewis Research Center.